Improving Carcass Merit with Ultrasound Scanning

by Kelly Vorac Cole[3]
Jefferson, Maryland

The aim of this article is to educate sheep and goat producers about the value of using ultrasound when selecting breeding stock. Research shows that the heritability of loin eye is very high at 50%. However, the data set collected from Suffolk ram lambs at the 2004 Pennsylvania ram test suggests that loin eyes need improvement. **See Table 2.**

Situation

The U.S. sheep industry is very fragmented today. Two very large segments have emerged in the industry -- the frame show-type sheep and the wether sheep shown in market classes. A similar situation is emerging in the meat goat industry. The problem is that both of these segments are shifting away from the core values of commercial meat production. Ultimately, all sheep and goats must have the carcass traits required to satisfy the consumers. Selection for these carcass traits will be key. If the sheep and goat industries are going to become viable commercial meat entities, they must return to the basic core values held by the commercial swine and cattle industry. Those core values are performance and carcass traits. This article will focus on the latter.

Carcass traits

In sheep and goats, hind saddle, loineye, and rack are the highest priced cuts of meat. These are the same traits valued in swine and beef. The swine industry has done a tremendous job increasing loineye area. They have done this by collecting data using ultrasound technology, which can measure loineye area in the live animal. Live evaluation allows selection for increased loin area. Loineye area (LEA) is one of the most highly heritable traits at 50% heritability. **See Table 1.** This high heritability indicates how easy it should be to increase LEA. In just 10 years, the swine industry increased loineye measurements from 4 to 5 square inches to 6-8 square inches – that amounts to a 50-60% increase in loin area.

Carcass Evaluation with Ultrasound technologies

Since the 1950's, ultrasound technology for biological application has been available for use. Ultrasound consists of very high frequency sound waves. Pulses are produced in a transducer by the vibrations of piezoelectric crystals. These pulses are transmitted through tissue until they reach a tissue interface, such as between fat and lean tissue. Ultrasound images appear in various colors and shades on the display unit. Bone and fat will appear white in color, while muscle and tissue will appear a dense grey color.

Table 1. Heritability of Carcass Traits	
Carcass weight	35 %
Trimmed retail cuts	45 %
Percent trimmed retail cuts	40 %
Loin eye area	**50 %**
12th rib fat thickness	30 %
Dressing percentage	10 %

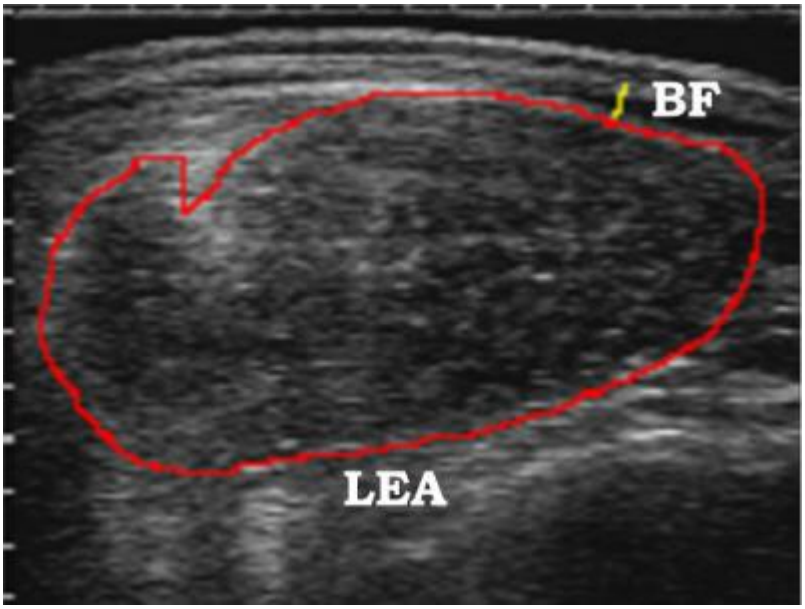

Figure 1

Body composition measurements are taken with an Aloka 500 real-time ultrasound machine equipped with a 3.5 MHz transducer designed for animal use. In the normal scenario for estimating carcass traits via ultrasound, a "Certified Technician" travels to a designated location with portable ultrasound equipment. The technician would apply a "couplant" (usually vegetable oil) to the back of the animal at a designated location. The couplant prevents the interference of air between the transducer and the animal. This allows for maximum conduction of sound waves. Real-time ultrasound will allow for an image to be produced immediately. This image can be captured to a computer's hard drive allowing for the images to be interpreted at a later time. Ultrasound measurements for backfat thickness (BF; Figure 1) and longissimus dorsi area, which is the LEA, (Figure 1) are taken between the 12th and 13th ribs on each animal.

Loineye area is measured in square inches and is positively and highly correlated with percent retail product (% RP). This trait is a moderately high heritable (0.4 to 0 .6) trait. This means that the trait will be passed on to progeny. Ultrasound measurements of LEA are accurate within one square inch of the actual LEA measurement. There is a 62 - 94 % relationship between the ultrasound values and measurements taken on the carcass at slaughter. Much of this variation may be due to the accuracy of the technician. Backfat thickness is measured in inches, and is a good indicator of % RP. However, unlike LEA, it is negatively and highly correlated with %RP. This means, as BF increases, % RP decreases. This trait is similar to LEA in heritability (>0.4). Ultrasound measurements of BF are accurate to within 0.07 inches of the actual carcass BF. Ultrasound BF is highly correlated (0.96) with carcass BF. Some believe ultrasound BF may be more accurate than carcass BF, because of the fact that no BF has been removed during the ultrasound process. Unlike in the packing plant, varying amounts of BF may

be removed when the hide is removed from the carcass.

How Does a Producer Use Ultrasound Information?
Proper use of ultrasound data involves an understanding of its limitations. For example, rams having LEA measurements of 2.7 and 2.8 square inches are likely not detectably different. However, we could be more confident that a ram having an ultrasound LEA of 3.0 square inches is more muscular than a ram whose LEA measures 2.0 square. Ultrasound measurements may be most useful to distinguish which sheep and goats are above average, average, or below average compared to their contemporaries (e.g. flock mates), or within sire groups. One should closely monitor BF; this is an indicator of development of the animal and/or the maturity status of the animal. One must remember these are just a couple of traits to evaluate, and one should not get carried away with single-trait selection. With single-trait selection, one may be creating more problems than what they may be attempting to correct. Before embarking on the selection of future genetics, one must have a defined set of goals established for their own operation.

Hopefully, you are beginning to see that you can use ultrasound technology to measure the LEA on live animals rather than harvesting the animals and doing actual measurements of the hanging carcasses. Producers should take advantage of this opportunity for evaluation and selection of breeding stock. Many State ram and buck test stations collect ultrasound information for participating producers. Table 2 shows a subset of the data collected from the 2004 Suffolk ram test; a total of 16 Junior rams were on test. The LEA were adjusted for 125 pounds.

Cause for Concern:
Please note the 125-pound loin eye measurements in **Table 2**. These young rams should represent a good cross section of progressive breeders in the Northeast. Note that the average loin eye is 2.49. Further note that the average drops to 1.94 square inches when ram number 30 is omitted from the data set.

Table 2. Suffolk Junior Ram Lambs from 2004 Pennsylvania Ram Test

Ram ID	Weight (lbs)	LEA (in^2)	Adj. LEA (in^2)	Adj. BF (in)	Genetic type
28	163	2.29	1.93	0.15	Frame
29	183	3.27	2.65	0.13	Wether
30	**176**	**4.50**	**3.97**	**0.17**	**Wether**
31	186	2.52	1.86	0.14	Frame
32	161	2.80	2.46	0.20	English
33	160	3.25	2.90	0.13	Wether
34	176	3.18	2.65	0.16	Frame/wether

35	148	2.32	2.15	0.15	Frame
36	156	2.55	2.28	0.12	Frame
37	143	1.77	1.67	0.17	Frame
38	146	2.76	2.60	0.18	Wether
39	156	3.05	2.78	0.15	Wether

The sheep and goat industry in the U.S. has not adapted selection technology as quickly as the swine and beef industries. In reading this article, we hope that you see a great tool that could greatly benefit the sheep and goat industry. Let's use this technology to increase the percentage of retail cuts. Research has shown that LEA is highly heritable. We believe this technology can increase the value of American lamb and goat, which will increase profitability to our farmers.

"Once I chose to focus on breeding for loin eye, I found it very difficult to find sires that could increase carcass traits such as loin eye without first measuring the LEA of the ram and collecting real data. I have made many mistakes choosing rams that I thought had large loin eyes based on visual appeal, only to find that is was not there when the offspring were born."

John Hall, Suffolk breeder and Extension Agent, Kent County

For further information on ultrasound technology, contact Willard Lemaster (Lemaster@umd.edu), Susan Schoenian (sschoen@umd.edu), or Niki Whitley (nwhitley@umes.edu).

[3]Kelly is a Suffolk breeder in Jefferson Maryland. She received assistance on the article from J. Willard Lemaster, 4-H Animal Science Extension Specialist, University of Maryland; John Hall, Kent County Extension Agent and Suffolk breeder; and Susan Schoenian, Sheep and Goat Specialist.
